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Edited by JOHN BARTLETT.

THE MOUNTING, FRAMING AND HANGING OF PHOTOGRAPHS.

WITH the oncoming of the season when the ripe fruits of the camera are ready for the annual exhibition, the grave query comes from the ranks of the amateur and professional, "How shall we mount our photographs so that their good qualities may show to the greatest advantage, when hung upon the walls of the exhibition rooms?"

To judge from the many exhibitions we have seen, the conclusion must be reached that as far as mounts are concerned, "Motley is the only wear." The blues, the greens, the reds, the purples, the blacks, the yellows, are made to do service indiscriminately without any regard to the damaging effects they produce upon the photographs themselves.

It is said that the primary object in mounting and framing a picture is to isolate it from surrounding objects, so that the attention of the spectator may be directed especially to it to appreciate its artistic merits, and that the best service a mount and frame can do for the picture is not to interfere with its effect; but we are assured from experiment that there can be no neutral ground in the action of accessories. If the mount and frame do not enhance the good qualities of the photograph, they do positive injury by their presence. Every one knows of what value to the artist is the knowledge of simultaneous contrast of colors. To the photographer it is equally important—we ought almost to say, equally essential—to know the effect of the juxtaposition of light and shade in order to produce certain definite effects. All our knowledge, we are told, is relative; so light and dark are only relative ideas,—like great and small, hard and soft. We cannot judge of anything absolutely—we judge only by comparison. The dimensions of a certain thing cannot be truly estimated unless we possess some fixed standard as a guide; and the same object is soft or hard according to the power of muscular resistance. And so the light of one object may be comparatively dark when placed in relation with the light of another object.

This latter fact can be easily demonstrated, so as to show that our errors of judgment are very largely responsible for our mistakes in decision. A piece of gray paper out in the full blaze of the sunlight is in reality much lighter than a pure white sheet in a darkened corner of a room, yet we do all unhesitatingly declare from *a priori* judgment that the sheet is white, and the piece gray.

An object of a certain tint always appears darker when placed in proximity to a much lighter object, and *vice versa*. If we take, for instance, a medium gray, and place it upon two different grounds,—one of which is lighter, the other darker, than the superimposed gray itself,—its appearance will be strikingly different in each case. Upon the lighter ground it will look much darker, while upon the ground darker than itself, it will seem much lighter in tone. Anyone can easily prove the truth of this by cutting two circles of the same gray piece, and placing them upon the two grounds. The different effect is so great that it is impossible to realize that both circles are identical in color, until we place them both on the same ground.

Now, this change of brightness by contrast with the ground is precisely what takes place, although the spectator is unconscious of the operation, when a certain tone of a photograph is brought into contrast with a mount darker or lighter than itself. Not only is the character of the photographic tone changed, but the whole perspective is really altered. We know this last remark will be challenged, but we think it may be practically demonstrated, as well as theoretically proved. We have materially changed the character of the perspective by change of mount. For instance, in a landscape photograph, the distant mountains are rendered much lighter in tone than the foreground. Now, it will be readily seen that this tone may be deepened or lessened by the juxtaposition of a mount whose tone is lighter or darker, and the distance will approach or retire accordingly.

When we look at an object, we do not fix our eyes steadily upon any one part, but the vision wanders over the whole field. When we turn the eye from a dark surface to a light one, there is a superposition of impressions upon the retina; the light portion of the new impression, falling upon that part which had previously received the dark portion, is made more intense because that part of the retina is less wearied than the part acted upon by the light of the first impression. We have, perhaps, gone too far into the detail of the subject in a practical paper, but we were anxious to show that the character of the mount was not a question to be left to mere individual fancy. There is another factor in the case. We have tried to show how a mount of a tone darker or lighter than the color of the photograph influences its character. It is equally true that the special color of the mount also acts injuriously or beneficially upon the photograph. We shall be brief, and only refer to the physiological effect of colors when placed in juxtaposition; how that red, for instance, will give a comparative greenish cast to the tones, and yellow a bluish shade.

It is really worth trying the effects of different colored mounts upon the same photograph. A yellowish white mount, for instance, when used in connection with a landscape photograph in which the distant atmospheric effect is represented by a perfectly neutral gray, gives a more delicate, bluish, ether-like appearance to the distance; while a gray mount, although inclined in tone to blue, does not show nearly so fine an effect. Now we are sure anyone who values the effect of atmosphere in his photograph would look to the character of the mount. A purplish gray tone in a photograph will be found to look towards blueish when the mount is whitish yellow.

We have not touched upon effects of the various hues of colors which the card manufacturers present in their stock, believing that all the photographic tones may be perfectly accommodated with grays and buffs. We think, too, we have said enough

to convince anyone of the necessity of the wedding garment in the color of the mount, if he is desirous of having his photographs enter the kingdom of art.

Now a word on framing and hanging, and we are through. The most we would ask of a frame would be to be quiet, and not to blazon in scrolls and gingerbread twists its vulgar pretensions. Flat, square frames with modest mouldings are most appropriate; but, beseech you, keep clear of plush or velvet mats, or puckered silk and gold frostings, and rustic logs and cross-ties, and bunches of kindling wood.

In hanging, the only suggestion we shall venture is to allow more space between the exhibits, so that the frames are not in visual agglomeration.

SOMETHING MORE ABOUT PORTRAITS.

PORTRAITURE, notwithstanding it is the "hourly, momentary task" of the photographer, requires above all the other branches of the art, the constant exercise of the inventive faculty.

The conditions for maintaining a pleasing mediocrity are so easily fulfilled, that the tendency to "keep invention in a noted weed" is a great temptation, especially with operators who have attained to proficiency in certain pleasing effects which catch the public taste.

It is so easy and yet so difficult to portray the human face,—so easy, if one have no regard for beauty of expression; so difficult, if one have a perception of the wonderful mobility of the features when animated by the impulses of the mind. Originality in delineating the expression is kept alive only by observation. An artist must be one in thought, word and deed, or he is unworthy of his calling. Wherever he goes his eyes should be open, to acquire something useful in his profession. It is a delightful study to watch the play of emotion or thought upon the countenance,—an omnibus or a railroad station is a theater with marvelous actors, each playing his part with consummate skill.

But the photographic operator is eager to cry out, "My calling keeps me, the greater part of my time, within the walls of my studio; how can I study nature, human or inanimate?" Ah, but we might say, "Yours is a privileged calling, since Nature in her finest forms comes to you." Do not err in imagining that human nature may not be studied within the narrow confines of even a village photographic gallery.

We have almost positive evidence that Shakespere never left his native England, and yet how profound is his knowledge of human nature; he is the very mirror held up to nature. The photographer has a rare opportunity to be a student of men. We would not have him to be a physiognomist,—that is, to judge of traits of character by generalizing on the features, but we would that he were possessed of the faculty of reading the mind's discernment in the face. We would that he were able to catch the proper expression of the mental temperament of the man or woman who enters his gallery with malice aforethought to be what he or she naturally is not.

To be painted or to be photographed, with the great mass of humanity, is synonymous with being put out of the natural environment in which they live and move and have their being. The preparations are elaborately made for the ordeal; the courage is screwed up to the sticking point, so as not to fail at the critical moment,

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the advent of which is announced with becoming dignity by the operator, who stands beside his camera, like a sheriff's recorder, to take advantage of the distress of his victims.

Now it is just in the operating room—we were going to say chamber of torture, but forbear—that the skill of the photographer comes into play in removing all constraint, in dissipating the feelings of nervousness or solicitude as to the result. To a keen eye some bodily movement will reveal the disposition of the sitter. This gives the cue to treatment. Let him listen, with all patience and meekness of soul, to the admonitions, the desires, the demands of his sitters. Let him seemingly acquiesce, seem delighted with the suggestions, and compliment the excellency of taste, the perfection of judgment; but, withal, let him pursue his own way with all diligence, knowing that the notions of the one who sits enthroned are but as sounding brass and tinkling cymbals to his attuned ear for harmonies.

And, finally, when the glorified expression of self-satisfaction, the beauty of pleased vanity, the ripe perfection of delighted expectation are reflected upon the face, squeeze the bulb that releases the shutter, and leave the rest to the chemicals; and when the sitter comes to look at the finished work, acknowledge, with all due resignation, with profuse gratitude, the exultant intimation that the success of the operation is solely due to his or her advice and suggestions for improvement. Such a procedure may be a terrible extinguisher upon your self-esteem, but if pride is above the desire for success, give it better scope than it can have in the photographic profession. If you will watch the beauty of animation which transfigures even a homely face under the treatment we suggest, we think the gratification will carry its own infinite reward. It is almost like gathering figs from thistles.

We have been favored this month with a series of photographs from the studio of Gilbert & Bacon, of Philadelphia, who have long enjoyed a reputation for artistic skill in posing, as well as for fine technical qualities of photographic work. A conscientious regard for high quality, even in the photographs of the ordinary sitters, has gained them this high reputation amongst the fraternity, as with the general public. They are fortunate in the possession of an operator, Mr. M. R. Hemperly, who is possessed of artistic taste in posing and lighting his subjects, as well as judgment in understanding the character of those who come with their big commodity of good suggestions. Doubtless these admonitions of the sitters are poured into a seemingly receptive ear, and they are flattered with the high presumption that their taste is superior to his. But he pursues the even tenor of his way with an eye quick to discern any phase of expression, any new suggestion for improving his ideas. It is thus that he secures originality in his work, and prevents his style being "still ever the same," to the disgust of patrons who, like the Athenians of old, are ever looking for some new thing.

There seems to be a diversity of opinion with respect to the merits of the hydrochinone developer. By some it is regarded as the *ne plus ultra* of developers, whilst many practical operators complain that they obtain nothing but harsh, cold effects, no matter what formula they employ.

It is our intention to make comparative experiments with hydrochinone and pyro, the results of which we shall present in our next issue.

PERSPECTIVE IN PHOTOGRAPHY, AND THE USE OF WIDE-ANGLE LENSES.

IN continuing the subject of perspective, we feel that we cannot make a better beginning than by asking our readers to remember that pictures are not made in order to solve mathematical problems. "Truth in art" is a phrase that has been bandied about and misrepresented by countless writers upon art æsthetics, chiefly in reference to painting; but let us assure those who may be conscientiously striving to have their results "true," that a too rigid observance of mathematical precision and exactitude in the perspective of photographs will often lead them into the perpetration of glaring absurdities.

Interior views of halls, large rooms, public buildings, etc., are generally not difficult subjects to photograph, supposing that the light be at all good. It is quite different, however, with small interiors, studies, libraries, bed-rooms and offices, where there is so little space at the operator's disposal that the camera has to stand very close to some of the principal objects; thus necessitating the use of a very wide-angle lens to include enough subject to make the picture worth taking. The difficulty in these cases has doubtless been noticed by everybody. Chairs, tables and stools near the camera are immensely larger in proportion than those at the other end of the room, or even than the doorway by which a person of full stature makes exit. In some cases the floor seems to run sharply up-hill, giving an uncomfortable idea that the chairs and tables are but temporarily suspended upon it, and that the slightest jar would cause them to slide down. The only thing to do when called upon to photograph such places, is either to gain a little more space, if possible, by putting the camera outside one of the doors or windows, or by so disposing and arranging the furniture that nothing may come very close to the lens. The master or mistress of the apartment will often be able to make these alterations without materially changing the habitual look of things, if it be explained what the object in view is, and the necessity for the change. As we write, we have before us a singularly beautiful specimen of interior work made on an 8x10 inch plate with a seven-inch focus Ross Symmetrical lens,—a much wider angle than is commonly used. The room was a very small one, but by judiciously pushing back a large reading chair and footstool, so that the immediate foreground was left vacant, the operator succeeded in including quite enough subject to give an excellent idea of the apartment without the distortion that might have been expected from using such a wide angle. We can think of no more instructive and interesting experiments for the amateur than interior work such as we speak of.

In every class of photographic pictures taken from nature direct, but particularly landscape and architecture, it is important to remember that the view when taken is supposed to be made from the same height as the eye of the spectator when standing,—i. e., five feet from the ground. Considerations of artistic propriety, or pictorial effect, to put it in other words, will often render it necessary that the point of view should be higher or lower than the level named; but the fact as stated ought not to be lost sight of. Indeed, for many landscapes it may be fairly questioned whether the proper height would not rather be at from six to eight feet above the ground, when we remember that the majority of persons see the country from a wagon or horse's back. A *high tripod* also is a most useful thing in landscape pho-

tography, if for no other reason than because by keeping the camera well elevated, there will be less interference from underbrush, loose twigs, rocks, etc. But it is important for us to remind our readers that just the contrary of what we have been saying will often be so true, that the neglecting to put the camera well down will produce the most ridiculous and painful effects. We have seen pictures by clever French painters of, for instance, two persons in two boats, that had been taken at so much too great an elevation that the water appeared as though standing at an angle of 45° , and the boats in imminent danger of rolling over each other. All of this might have been avoided by having chosen a standpoint lower down and nearer to the surface of the water. A class of photographs where this same fault is often seen is the attempt to take water-fowl of different varieties from a bridge or bank. The camera is too high to give pleasing perspective lines in the picture, and the consequence is that the birds appear as if attached to an inclined sheet of water.

Among the curious and apparently untrue effects of perspective produced by the camera, are the appearances presented by rows of balls when photographed in various ways. A perfectly straight row of balls of equal size, taken with a wide-angle lens close on, would show those at the edges and corners of the plate more or less elliptical in shape. If the row instead of being straight was semi-circular, they would also look larger, or rather, let us say, higher. A chain of mountain peaks surrounding a valley might, in an extreme case, suffer a similar distortion; but only the other day we saw an otherwise excellent interior view of a drawing-room-car with the tables set for lunch, and where every round object like a tumbler, fruit-stand, or bottle was distorted into an oval or elliptical shape when at all near to the corner or edge of the plate. In the case of the mountain peaks, if the distortion were offensive, it might be rectified by having the groundglass made to swing on a pivot so that it would stand at an angle with the central rays from the lens; the glass being so swung at the time of taking the view as to stand parallel with the mountain peaks. This principle might, perhaps, prove successful with rows of balls also, but by far the better plan would be to retire to a greater distance, and use a longer-focus lens.

In our last paper we spoke of some of the faults seen in portraits when a too short-focus lens had been used, and the distance between lens and sitter not great enough. Portrait lenses generally include less than 60° of angle, but the distance at which to place the lens can hardly be positively laid down. Vogel gives as follows:

For lenses of 24 lines opening and 7 inches equivalent focus, about four feet distance.

For lenses of 30 lines opening and 9 inches equivalent focus, about seven feet distance.

For lenses of 36 lines opening and 10 to 12 inches equivalent focus, about eleven feet distance.

This might serve as a rough guide, though it should also be remembered that painters have recommended a distance of at least twice the height of the object between artist and sitter in drawing or painting; *i. e.*, 12 feet for a six-foot sitter. The painter, however, is much more free in his treatment of the subject than the photographer. An instructive experiment might be made by taking two portraits of the same sitter with the same lens at distances of six feet and twelve feet; when they

were both enlarged to life size there would be the same marked differences to which we have before alluded.

We hope we have made it plain to our readers that the knowledge of perspective useful to the photographer is of an eminently practical character, and that the obtaining of it is synonymous with the *artistic training of the eye*. No weary plodding through dry mathematical treatises and formulæ will here be demanded of the student, but the far more enjoyable, though no less difficult, study of the education of the eye and the thoughts to natural beauty and symmetry. This is to be done by critical study of good pictures of every class, and by observance of nature—surely a more congenial employment, and surely also one that will bring with it that "truth" and "fidelity to nature" about which so much noise is made in the artistic world.

Before taking leave of this subject, let us give a few points that may be profitably born in mind. Ordinary perspective is always calculated for pictures on vertical planes, so that any image executed in correct perspective might be considered as formed on a sheet of glass standing vertically, the objects seen through it having been drawn or photographed upon its surface. Again, supposing that a large sheet of glass were set immediately in front of the observer, so that with a long brush he could reach up to trace the outlines of the clouds over his head as well as of the ground beneath his feet; when the picture was completed it could not be satisfactorily viewed from the same distance as it was drawn from, and the spectator would be compelled to step farther back to see it, when it would immediately be pronounced false and wrong.

We believe that we have now said enough to convince our readers, particularly if they give a little time and thought to the matter, that the reason why the majority of paintings and hand-made drawings give a pleasing effect of perspective where the photograph would appear distorted and exaggerated, is because *the painter paints his subject as it would appear to the eye without effort*. For it must be remembered that both the head and the eye-balls are constantly in motion, and that if a large angle of vision has to be included, it is thus done unconsciously. The lens, on the contrary, is fixed, and no matter what angle the optician may have constructed it to include, it will immediately betray in the negative any attempt at representing a larger angle than would be natural to the eye if located at the same point and held to the same rigid fixity; for, although the eye may be made to include 180° or more, it is doubtful whether it ever sees more than an inch or two with perfect distinctness at one time, when kept in a fixed position.

ELLERSLIE WALLACE.

CHLOROPHYL DERIVATIVES IN ORTHOCHROMATIC PHOTOGRAPHY.

DR. WOLLHEIM, of the Imperial Academy of Science in Berlin, has been engaged for the last six months in investigating, in a truly scientific manner, the action of dye-stuffs as so-called optical sensitizers. The partial results of these efforts are published in a recent number of the *Photographische Mittheilungen*, accompanied with remarks by the editor, Dr. Vogel.

Dr. Wollheim speaks of the difficulty of obtaining a medium equally sensitive to

all parts of the spectrum, and also of the difficulty encountered in impregnating a gelatine plate with chlorophyll solutions, on account of its insolubility in water and ammonia. When a freshly prepared alcoholic solution of chlorophyll is largely diluted with water, if the operation is carefully done, the fluid seems apparently clear, retains its specific absorption band, but does not show fluorescence in reflected light, but shows plainly opalescence, the chlorophyll being really no longer in actual solution, but merely in a fine state of division, suspended in the fluid and consequently unfit for uniform impregnation of the film of the gelatine plate.

The Doctor's method of managing the chlorophyll staining of the plates is as follows:

The plates were bathed in a mixture consisting of 1 part fresh chlorophyll tincture, 5 parts water, and a little ammonia.

They were kept immersed for a minute, and then some dried and others employed wet.

The results, wet or dry, were the same; with short exposures he obtained a deep and broad maximum from D to E, running off uniformly towards the sides. With long exposures (18 minutes), the remaining bands of the chlorophyll spectrum were visible, Band I. to $\frac{1}{2}$ B to C, II. in the middle between C and D, and III. close on to D lying towards blue.

As the chlorophyll by no means showed the strongest absorption in the green, but like all chlorophyll derivatives, in red (Bd. 1), it follows that this increased action of the light is had at the cost of that of the other regions of the spectrum.

His next experiments were with phyllocyanin (Fremy's phyllocyanic acid.) He found that phyllocyanin in alcohol or in water very largely diluted with ammonia alcohol gave precisely the same spectrum as chlorophyllan.

The scale of intensity of the bands, beginning with the darkest, I., IV., II., V., III. For practical use he bathed plates in a solution of phyllocyanin in 2 c. c. m. ammonia, 20 c. c. m. alcohol and 80 c. c. m. water, exposing the plates either wet or partially dry, and obtained exactly that spectrum which photographically corresponded with the phyllocyanin spectrum, that is to say, the absorption bands as bands of action.

Plates exposed entirely dry, as well as plates bathed merely in ammonia water, without the alcohol, gave a spectrum whose absorption bands (likewise very clear and sharp), possessed the intensity scales I., II., III., IV., corresponding with the spectrum of phyllocyanin in ammonia water.

The same photogram was manifest on the application of phyllocyanin (zinc oxide), which gives in alcoholic solution, as in alkaline, the same spectrum as that obtained with a freshly made chlorophyll tincture.

Dr. Vogel is of the opinion that these researches confirm his views concerning optical sensitizers, which have been the subject of recent criticism. Vogel reviews his ideas first published in 1873, and hints at the confirmation they then received from Becquerel. According to Vogel's theory the absorption bands of any dye stuff correspond with the place of greatest action of the spectrum upon the plate colored with that particular dye.

For instance, Fuchsin shows an absorption band in green-yellow of the spectrum. Now, if a bromide of silver collodion plate is colored with Fuchsin and the sun's

spectrum taken upon it, there is manifest in the place of the absorption band (that is, the green-yellow), a powerful photographic action. Vogel made the same observation when employing picrate-green, which has an absorption band in the red. In the same spot is shown a powerful action of the sun's spectrum upon the plate dyed with picrate-green. Similar results are obtained with naphthaline red, coralline, methyl-violet, cyanine, etc.

From a consideration of these facts Becquerel came to the conclusion that if Vogel's ideas were correct, that chlorophyll which shows a characteristic absorption spectrum with several bands, should, as an optical sensitizer, act in several places in the spectrum with strong effect. Thus chlorophyll became the touchstone to test the truth of the absorption principle. Becquerel's experiments confirmed the pre-supposition.

Chlorophyll gave several photographic maxima corresponding to the absorption bands I., II., III. Some years later Becquerel's discovery engaged the attention of the brothers Ducos du Hauron, who employed for a long time chlorophyll collodion for their photo-chromatic work.

The Ducos du Hauron brothers at first employed chlorophyll alone, but afterwards made use of it in connection with eosine; finally they gave up chlorophyll on account of the uncertainty of the results incident upon the alteration of the character of the chlorophyll at different seasons of the year.

"About this time," says Dr. Vogel, "Ives took up chlorophyll and made known that myrtle chlorophyll was the best adapted for chlorophyll plates. He used the same for collodion plates, and published the process.

Eder was the first to use chlorophyll in connection with gelatine plates, obtaining a relatively weak, but decided action.

He steeped ivy leaves in alcohol and poured the solution in ammonia water. Dr. Vogel, in continuation of his remarks, says, "Ives recently published an account of some new experiments with chlorophyll with gelatine plates which Vogel says are talked about as if the results yielded practical chlorophyll plate."

Ives, quoting Dr. Vogel again, says in his original publication (*Journal of the Franklin Institute*), "The degree of the color sensitiveness of the chlorophyll plates depends upon the ordinary sensitiveness of the plate (for white light.) The most sensitive kind is flowed over with alcoholic solution of chlorophyll, quickly dried and softened in water for at least five minutes, and used immediately."

Ives himself declares that the increased blue sensitiveness of the plates occasioned by the chlorophyll necessitates the employment of an extra dark orange screen. Vogel thinks that the unusual blue sensitiveness is an objection to these plates, especially as it is not easy to secure a screen which will absorb the proper amount of blue light, and also the want of keeping qualities in the plates he thinks is another objection. He says there is great uncertainty in the composition of chlorophyll. The alcohol solution of chlorophyll contains no longer chlorophyll, but chlorophyllan, together with vegetable acids, wax, etc.—the action of an alkali causes the formation of phyllocyanin. He concludes the above remarks by saying that a scientific investigation of the nature of these chlorophyll derivatives is much needed, as well as their photographic effect.

Dr. Wollheim is filling the gap with his experiments. He has been for half a

year in the laboratory of the Technical High School under the direction of the Minister of Instruction, and at his earnest desire has specially undertaken the investigation with reference to this photographic application.

[All the statements embodied in the above paper are probably correct, except that it was Ives, not Hauron, who first used chlorophyl and eosine together upon the same sensitive plate. It is also proper to emphasize the fact that Ives was the first to try to produce "orthochromatic" negatives with chlorophyl plates, and obtained results which have probably never been surpassed, years before the possibility of producing such negatives was recognized by anybody else. Notwithstanding his recent discovery of a successful method of treating gelatine plates with chlorophyl, Ives has repeatedly expressed a preference for cyanine, if applied in the same manner, and agrees with Dr. Vogel that there are some objections to chlorophyl for this purpose.—ED. A. J. P.]

SUCCESS IN PHOTOGRAPHY WITH THE FLASH-LIGHT.

Read before the Photographic Society of Philadelphia.

IT is almost an article of scientific faith with many photographers, that the light which operates in producing the chemical changes by which photography is made possible, is something completely independent of the ordinary light, which produces impressions upon the retina, resulting in vision.

A peculiar force called actinism is said to operate in a mysterious way upon the particles of sensitive bodies,—a distinct principle resident in the sunbeam, associated with light and heat, yet distinct and separate.

Now, the truth is, as recent investigations have shown, and as Becquerel maintained nearly a half century ago, in opposition to the views of Draper and others; the radiations from any source of light, extending from the extreme violet to the extreme red of the spectrum, differ only in the rate and magnitude of the vibrations which are at work. The luminous, the heat and the chemical or actinic rays, are merely modes of the same force, which is nothing more than a system of vibrations.

The difference between the light at one end of the spectrum and the other is analogous to the difference between notes of high and low pitch in music. If, for instance, we should accelerate the vibrations which at any time are manifest to us as red light, we would have the effect of violet; or if the violet should be retarded, we would have the phenomenon of heat-giving rays predominant. In light as in sound, there is a system of regular disturbances of a medium, which produces long and short, slow moving and quick moving waves.

Photography is merely a means for securing a permanent record of these disturbances. The salts of silver are so constituted that the action of the short waves, the very rapid violet undulations, is necessary, to start the molecules into a shudder or tremor. The condition of equilibrium of the silver molecules is such that a response is given at once to the impact, a resistance is offered, just as the sea waves meet resistance with the shore. The direction and velocity of the waves are affected; the molecules rearrange themselves to a new condition of equilibrium; the greater number taking up and propagating the violet wave motion, while the others file off in the line of the longer waves.

The sun is not the only source of radiation which produces chemical effect. Any substance which, when subjected to the action of intense heat, resists all tendency to conversion into vapor or gas, still remaining in a solid condition, gives, when the radiations from it are passed through a prism, a continuous spectrum similar to the sun's spectrum.

There are several bodies which resist the vapor-converting action of the highest degree of heat, and give, like the sun, uninterrupted spectra.

The carbon points of the electric light arc yield a pure, white light which presents a continuous spectrum from red to violet; so do incandescent magnesia, lime and other bodies.

But the various groups of color in these spectra are not always distributed in exactly the same proportions, as in the sun's spectrum. In some the yellow and red will predominate, in others the blue. Now, as the salts of silver are influenced chiefly by the blue rays, it follows that any incandescent solid, rich in such rays, is especially valuable in photography, although its heat-giving and light-giving rays may be less extended than in the sun's spectrum.

Magnesium, when supplied with oxygen, is converted into magnesium oxide or magnesia, which is practically infusible at any temperature we can reach.

It therefore gives a continuous spectrum, and although its light-giving qualities are inferior to the luminosity of electric light, it is far richer in actinic rays—we use the word with caution. The light from burning magnesium, or rather incandescent magnesia, is not so intense as sunlight or electric light—a great advantage in securing soft, harmonious photographs. Bunsen and Roscoe estimated the light of the sun, as compared with incandescent magnesia, to be five hundred times as great; while the sun's actinic intensity is only thirty-six times as great.

To secure the full photographic value of the magnesium flash-light, certain conditions are necessary. Metallic magnesium, in foil or ribbon, readily takes fire and burns at the expense of the oxygen in ordinary air; but the combustion is much slower, and the magnesium-oxide is less incandescent than when the metal is finely powdered, and projected into a flame. When burned in oxygen the incandescence is greatly augmented. Now, any body which supplies an abundant stock of oxygen to the metal in a prompt delivery causes a large quantity to be ignited in a short time, thereby increasing the amount of energy, and, consequently, the incandescence. It is necessary, therefore, that the energy should not be dissipated but concentrated, so the flash may be of the shortest possible duration.

Our experiments with the powdered magnesium were begun immediately after the publication of the results of Gaedeke Miethe, of Germany, to whom belongs the honor of having first shown the great possibilities of the *new* magnesium light. An account of the various methods employed, and the results we obtained in our endeavors to secure orthochromatic effects, would form an interesting talk.

Our first trials were made according to the suggestions of Dr. Piffard, of New York, by sprinkling the powered magnesium upon gun cotton; but the combustion was not prompt enough, and our sitters were taken with closed eyes. The magnesium was not properly consumed, and much was wasted. The use of gun cotton suggested collodion: we accordingly mixed powdered magnesium with chlorate of potassa, and then stirred the mixture in plain collodion until the ether and alcohol

evaporated; the result was an intimate mixture of a granular character, the chlorate and the magnesia being really enclosed in little coats of the collodion. The spontaneity of the powder was much increased, and its strength also augmented.

We also tried various mixtures for increasing the energy of the powder,—picric acid, bi-chromates, nitrates, chlorates, etc., etc., but we very soon abandoned them all on account of the highly dangerous and poisonous character of the combinations. We endeavored to find a compound which, while simple in composition, should yield the greatest amount of energy when ignited. A happy accident suggested the employment of a substance which fortunately was non-poisonous in nature, while extremely energetic in its action when combined with magnesium.

We found that we could entirely dispense with chlorate of potassa, picric acid, and the other dangerous chemicals which had hitherto been employed; the resultant combination ignited with more spontaneity than any other compound we had made, and was not explosive by ordinary percussion, even when subjected to considerable friction. The powder was christened Blitz-pulver, in honor of its rebirth in Germany, the baptism being a baptism of fire. We think we can safely say that no other form of magnesium flash-light has yielded such excellent results. The views which we shall exhibit this evening were made by igniting moderate charges of the powder.

A few words as to the best means of using the light may be of interest. We generally employ the unscreened light, although certain subjects might require a diffusion of the rays by means of a gauze or ground glass; in such cases we would increase the amount of powder used. As a general rule, the point of ignition of the powder should be at a height of five feet or more, in order to cast the shadows low; but sometimes these shadows may be very effectively introduced,—that is, artistically speaking. The shadows may also be prevented by placing the sitter at some distance from the background, and raising the position of the light to six or seven feet from the floor.

For portraiture, the light should strike the face at about an angle of thirty or thirty-five degrees to a line drawn from the camera to the sitter. The light, if possible, should be placed slightly behind the camera, but if it is necessary to approach nearer the sitter, the lens should be shielded. The room in which the exposures are to be made, if figures are introduced, should be well illuminated with gas or lamp light, the object of which is to secure good expression in the eyes. As is well known, the pupil of the eye contracts under the stimulus of strong light, and expands in weak light. In total darkness, doubtless, it is widely expanded. Now, as the nervous response of the pupil to stimulus is less rapid than the duration of the light, it will be seen that if a photograph is taken in total darkness, the registering of the appearance will be made before the nerve has time to carry the impression over the double track from without to the brain, and back to the eye. A photograph in which the eyes are represented with widely-expanded pupils gives the sitter an owl-like expression; but when just enough light is in the room, to expand the pupils a little above the normal, the expression is most beautiful and brilliant. This the gas light does, and the flash-light registers the expression.

In taking groups, be careful that the shadows of those in front do not fall upon the faces of those behind. The lighting for groups should be higher than for a single figure, and, perhaps, more directly in front.

In our first experiments we made use of silvered reflectors, but soon found that the light radiated was too strong for the shadowed face. If the paper in the room is light colored, no reflectors are needed. If the paper is dark, reflectors of newspaper are sufficient to illuminate the side of the face turned from the source of light. The reflectors should be large, and placed at some distance, say three feet, from the face. Focusing is best done by holding a candle in front of a newspaper placed in a line with the sitter's face. When the type can be seen distinctly on the ground glass, put in the stop and the picture will be sharp.

Few directions need be given for taking interiors. The lights can be left burning, and form part of the scene; they will not produce any flare upon the plate, provided the cap is not taken off until the instant before the powder is ignited. Interiors can also be taken in daylight, and the camera pointed directly at the windows opening upon the street. The mullions appear distinct and well-defined, and there is not a trace of halation.

The use of Blitz-pulver light for interior work not only saves a great deal of trouble and time, but, what is above all most desirable, allows the members of the family to occupy places in the picture, giving a more home-like appearance to the scene. From the absence of life in interior views there is always an impression conveyed of dreariness and desertion. The rapidity of the flash removes all constraint from the participants, and gives a naturalness to the scene which is delightful.

In taking interiors, care should be observed that the light is not reflected into the lens from mirrors, etc.,—the result, of course, would be fog. In photographing still life, groups, flowers, fruit, etc., the flash-light can be successfully used; the reflections from the polished surfaces are most beautifully rendered, and the whole effect is quite as fine as pictures taken in diffused daylight. Moreover, certain effects can be secured not possible by daylight; as, for instance, the appearance of steam or vapor from a foaming bowl of punch may be imitated by placing a smoking taper in the bottom of the bowl. The smoke will be caught in the quick flash, and will have all the look of steam, especially if some dark object behind it gives relief.

One of the most important applications of the flash-light is the photographing of animals. It is possible by its means to take animals at their homes,—the dog or cat upon the hearth forming part of the domestic circle, giving additional interest to the scene.

The flash-light has recently been employed in scientific investigations.

DuBois Raymond, taking advantage of the great expansion of the pupil in total darkness, and its inability to contract instantaneously, has used with great success the flash-light in getting photographs of the interior of the human eye.

Mr. Julius Sachse, of this city, has actually succeeded in photographing the visible growth of the rapid-flowering night-blooming *Cereus*.

The series of pictures taken at short intervals, in some cases not more than five seconds apart, show the peculiar spiral motion accompanying the evolution of the flower from the bud. The actual tremor of the flower in its eagerness for development is shown in a wonderful manner.

We refrain from speaking further of this novel application of the flash-light to this most interesting biological study, inasmuch as Mr. Sachse has not yet completed his investigations. He hopes shortly to continue the study, and promises to give us the benefit of his labors.

The Blitz-pulver light might also be used in studying the process, segmentation in the ova of the Tereido and other low forms of animal life in which the pellicles covering the eggs are transparent.

Our fellow member, Prof. Zeckwehr, has very ingeniously used the Blitz-light to demonstrate the truth of his views concerning certain musical movements.

Messrs. Rau, Harding and Davis, of the Philadelphia Society, have succeeded in making some interesting pictures of the interior of a coal mine, in which the structure of the vein is shown with a perfection never before accomplished.

In conclusion, a word about development of flash-exposures may be needed. We prefer to keep down, in developing, the amount of pyro to the minimum, because we like soft pictures. The pyro must be diminished, especially if there is white drapery in the photograph, or hardness and violent contrast will be the result.

We employ a weak developer, that is, one with considerable water, but with the alkali in slight excess. For instance, 6 oz. water, 1 dr. pyro, 2 drs. alkali. If we find the plate slowly building up in density, we refrain from adding any more pyro; but if, after a reasonable time, it is tardy in gaining strength, we cautiously increase the amount of pyro. After detail is secured, then labor for density, but not before. A developer with excess of alkali softens the high lights, and gives the shadows and half tones a chance; but just here judgment is necessary. The amount of alkali should not be such as to flatten the high lights: there ought to be a small area of brilliant white light in every picture which lays claim to artistic qualities.

JOHN BARTLETT.

PHOTOGRAPHING MACHINERY WITH MAGNESIUM BLITZ-PULVER

THE magnesium flash-light has a broad scope for its application, being a close rival for actinic pre-eminence, even for old Sol. R. Ray himself; but its importance looms up into special prominence when it is drafted into service which the sun himself declines to undertake.

The successful photographing of mines, caves and other dark interiors can now be accomplished not only in a very short time, but with greater ease and comfort than ever before; inasmuch as we can bottle up, as it were, our light in the shape of little potential grains, and uncork just when and where we please.

This transportable facility of the light induced me to try it in photographing machinery. My first occasion for its use happened to be upon a very dark, rainy day, and in a very dark, dingy machine shop. Under the best possible circumstances, with such surroundings, and in such position, even if the sun outside had been shining with meridian splendor, I would not have dared to give less than twenty to thirty minutes exposure; but with the additional impedimenta to sufficient exposure, I might have drawn the slide and waited a week for an impression. Our customer seemed to have a foreknowledge of the impossibility of the attempt, being surprised that I should have ventured out such a day, notwithstanding he had given the injunction that the work was to be finished and prints supplied the next day. His surprise was increased, and for the instant his faith in my sanity destroyed, when I told him that I was independent of heaven's boon of light, since I carried my commodity of luminosity in my pocket.

I placed the apparatus in position, put my head under the focusing cloth, but naught could I see,—it was as black as the Ace of Spades. I secured a couple of tallow dips, and lighted them to draw a focus upon, and also to determine the position of the machine upon the plate, placing the candles at the extreme parts of the apparatus. After the focus was accurately obtained,—that is, when the image of the flame of the candles was distinct upon the ground glass,—I put in a small stop to secure sharpness, left off the cap and drew the slide,—for there was not the slightest danger of any preliminary exposure,—ignited a charge of powder, put the cap on,—not from fear, but to keep myself in good habits,—and prepared for the ignition of another charge.

Believing I had bagged my game, I departed, giving the promise of the delivery of a dozen prints by the next morning. On developing, I found that I had obtained a most excellent negative, clear and distinct; and all the after treatment it needed was an opaquing out to obtain a clear background upon the prints, inasmuch as no suitable background had been placed behind the machine when photographing it. When the negative was dry (I preferred to wait till it was dry, although I could have used it wet), I at once made the prints on Eastman's bromide paper, and delivered them the first thing the next morning, to the delight of the customer, who was enabled at once to ship the machinery.

The means of employing successive charges of the powder upon immovable objects is a very great advantage. One can always be sure to get all the time he wants. Machinists and others will also appreciate the value in the saving of time and expense which the Blitz-pulver light affords. It is often impossible to photograph a machine in the shop where it is built, and if a picture is wanted it is necessary to take apart the apparatus and set up again in good light. Now, all this involves loss of time and money; I have been told that the expense would amount, in some instances, to fifty or seventy-five dollars. What a boon, then, is the Blitz-light in the photographing of machinery, especially as the work can even be better done than by daylight, the danger of halation from shop windows, etc., being much less.

THOS. H. MCCOLLIN.

NOTES ON COPYING.

PERHAPS of all photographic operations, copying is the most universal. There are few, if any, who, practising photography, have not at some time or other to make a copy. The intention of the writer is to review the different kinds of copying and the means taken to procure satisfactory results.

Copying may be defined as the reproduction of anything that exists on *one* plane (in contradistinction to photographing, which includes the reproduction of every visible thing on one plane or many), on a plane surface; a distinction, perhaps, in some cases with very little difference, but still sufficient to explain what the term "copying" in this article is intended to convey.

The methods required are very varied, each particular class of subject necessitating its own particular treatment to get the best results. The different subjects may be classed under the following heads: Black and white in lines or dots, as engravings, etc.; black and white with half tone, as India ink and pencil drawings;

colored subjects, as water-color drawings and oil paintings, old manuscripts, daguerreotypes, and glass positives. To begin with copying a line engraving. This is perhaps one of the most easy subjects to which photography is applied, and yet one that seems in many instances to be so difficult with gelatine plates that the old wet collodion process is still used in preference. The first thing to do is to set up the engraving to be copied *exactly* parallel with the focusing screen, and the lens *exactly* central with regard to the subject. If the camera is not properly arranged the lines in the copy will be out of drawing. The focusing must be as sharp as possible, and a small stop used. This part being satisfactorily arranged, the *illumination* must be next attended to. The difficulty of doing this increases with the size of the sheet to be copied. It is absolutely necessary that the whole surface should be equally illuminated, and the way of doing it is regulated in a great measure by the disposition of the windows of the work-room. If the source of light is from one side or top only, white reflectors will be necessary; in the usual glass-room a sheet of white paper, placed on an angle below the engraving to be copied, will generally suffice. A *wide-angle* lens should *not* be used; a rapid rectilinear, a symmetrical, or triplet lens is the best, and not worked to the full extent of its covering powers. If a short-focus lens is used, and the reproduction is required of the size of the original, the camera has to be placed so near the subject that it will probably interfere with the evenness of the lighting by cutting off most of the front light, or the perspective will be distorted. The *exposure* is the next thing; it must be just so long that the black lines are free from any reduction in development. The longer it is short of this the better, bearing in mind a rapid development on a well-exposed plate gives a much blacker image than if the development is prolonged. The rule in wet collodion was short exposure and weak, well-restrained developer; with gelatine the developer must be well restrained, but not particularly weak, and the process must be stopped before any reduction takes place on the lines; *any* veil on the shadows is a fatal objection, especially if the negative is required for photo-lithography or mechanical printing. The plates used must therefore be such as will work absolutely free from fog of any kind. All diffused and reflected light must be carefully guarded against: none whatever, except that forming the image, having access to the plate. The camera should be dead black inside, with a diaphragm if the lens used covers much more than the size of the plate—in fact, every precaution should be taken to ensure brilliancy of the image. It is an advantage to fix the plate in a hypo bath to which iron sulphate has been added, wash well, and dry. If on examination after drying the lines look clouded, they may be cleared by immersion in a weak bath of ferricyanide of potassium and hypo. Care must be exercised in doing this not to overdo it. If the plate is left in too long, or the bath is too strong, the image will be reduced unequally, and the negative spoilt. If the exposure has been so short that a *very thin* image is developed, there is a good deal of extra trouble in getting a sufficient density by any method of intensification. The longer the exposure the more easy it is in this respect, and the after treatment with ferricyanide permits a longer exposure than could otherwise be given. Well wash, and proceed to intensify with mercuric chloride, followed by sodium sulphite; this process can be repeated, well washing between each application, until the necessary density has been gained. In all cases the application of an iron salt to the film facilitates intensification. Ferrous-oxalate

development would probable suit this class of work, but my experience has been with alkaline pyro, that I have found to answer every purpose. There should be no difficulty in getting an absolutely black and white negative. In case of the ink or the lines being glossy, extra precautions must be taken to avoid reflected light from them by cutting off all direct front light, which is best done by a black cloth screen with a hole in it, through which the lens can be worked. Black and white subjects with half tones, require quite a different class of negative, much less dense.

The preliminary adjustments are *the same as in all cases of copying*, the difference being in the exposure and development. A somewhat longer exposure, and the development carried sufficiently far to give sufficient density without any after intensification, is best—*absolutely clear glass* on the shadows not being imperative. If we have to copy an ancient manuscript, yellow with age, stained and unequal in tint, as most of them are, the treatment depends on whether it is desirable to ignore the marks of time and bring it out in black and white, or if it is better to represent the discoloration. In the latter case we proceed as if copying a black and white subject with half tones, using an orthochromatic plate, by which means the yellow and brown are much reduced in force, and give a fairer representation of the original. Extra density may be obtained in the usual way with mercury and sulphite, providing the first development fails to give sufficient. A good deal depends on the amount of discoloration; at any rate perfect opacity is not required. There is no doubt in dealing with colors the orthochromatic plate has great advantages over ordinary ones, whether used with a screen or without. In copying pencil drawings, a short exposure and development with an extra quantity of pyro is indicated; as soon as the slightest veil comes over the darkest pencil lines stop the development, fix, and get sufficient density by after intensification; it is not requisite to get *perfectly* opaque lights and clear shadows, although they should be fairly so, as this would do away with the characters of the pencil and give the appearance of pen-and-ink drawing. The print should be made on a matt surfaced paper, which is preferable for all work of this class; if albumenized paper is used, the toning should be continued till all warm color is gone. Platinum and bromide papers lend themselves excellently well to this purpose. That water-color drawings—in fact, all subjects depending much on their color for effect—are best rendered by orthochromatic plates, there is no shadow of doubt. Water-color and oil paintings require much the same method of treatment in taking the negative, but oil paintings require special care to avoid reflections. This is best managed by screening off *all* direct front light, which necessitates somewhat longer exposure, but the advantages are manifold, and a little longer time in these dry-plate days is not worth consideration. Water colors will not bear any rubbing of the surface, but all dust should be removed by a broad camel-hair duster. Fix them flat against a board with drawing pins, or any other contrivance that will effect the same purpose, right way up; let the light fall on them from the same direction as that in which they were painted; this also applies to oil pictures, for sometimes the color is laid on so thickly, the artist depending for some of the effect on shadows cast by the impasted color, that if the light is admitted from the contrary direction it will prejudicially influence the effect.

Where there is sufficient space a picture can be most easily copied in the actual

studio in which it was painted. The arrangements for light in the painter's studio are generally such as to show the picture to the best advantage and to avoid reflections. Formerly this was out of the question, but in our modern style of working with dry plates this difficulty is overcome, and renders a picture copied on the spot, so to say, more satisfactory than any other place, for on a fairly bright day the exposure is not very much longer than that required in an ordinary glass room with the light screened off. There are no ugly patches of reflected light showing up the texture of the canvas and obliterating the painting, and even the sunk-in parts are not very pronounced. Many adopt as a preliminary to photographing the plan of sponging over the surface of the picture with glycerine and water or beer, leaving it moist while copying; either plan tends to equalize the surface and get rid of inequalities that would show as lighter or darker patches on the negative. It goes without saying that whatever is used must be removed with a sponge and clean water after the photographing is completed. Sometimes the colors are not quite dry when the picture has to be copied; this being the case, any application to the surface must of course be foregone, or the probability is the picture would be seriously damaged. In setting up the picture to copy it is sometimes an advantage to tip it slightly forward, the camera being tilted to the same angle. As the wedges at the corners are sometimes loosened in carriage, they should be tightened up so that the camera presents as even a surface as possible. The exposure for an oil painting is generally a little longer than for a water color of a similar subject, the oils and varnishes used reducing the actinism. The exposure is almost entirely dependent on the intensity of the color acquired by the vehicles used with the paints, rather than the colors themselves. Some very old paintings have so browned by age that the lights have about the same photographic effect as the shadows, thus precluding any chance of a satisfactory result. Unless the varnish is removed an ordinary modern painting will generally be sufficiently exposed in five minutes, if reduced to a fourth of its size and the stop being 64 U. S., on a plate of average rapidity; but of course so much depends on the light and other varying conditions that no definite time can be stated, but, whatever exposure is given, let it be *long* enough; an under-exposed copy of a painting is but a caricature at best, and never is likely to give satisfaction. The developer must *not* be one calculated to give strong contrasts. When the image is *thoroughly* well out, wash and fix, and if deficient in intensity intensify afterwards; better results will thus be secured than by prolonging the development, which is apt to destroy detail in the lights.

Glass positives are often required to be copied. In the first place ascertain on which side of the glass the image is, for sometimes they are blacked over on the collodion side, and sometimes on the glass. If the black varnish is on the *image itself*, the first thing is to see that it is perfect; if not, make it so. Providing the *glass* side is black varnished it may be scraped off, and the face of the picture pressed against black velvet, so that the resulting copy may not be reversed. If the glass is fairly clean, the image shows as well on one side as the other, but providing bubbles and striæ interfere, the surface must perforce be copied; a reversing mirror or a prism will put it in the right position. No particular difficulty is attached to this work, or precaution required; avoid reflections and develop with any ordinary good developer. To copy a picture on albumenized paper is rather more difficult, there is such a ten-

dency to granulations and coarseness in the copy unless some scheme is devised to avoid them. An unmounted print may be put into optical contact with glass, which will do much to remedy the evil. Place the print for a few minutes in a pan of clean water: when equally moistened lay it on a clear piece of glass, avoiding air-bubbles; put a few folds of damp white paper at the back, on which lay another piece of glass. The print, thus sandwiched, will remain a long time in a suitable condition for copying, but if merely wetted and laid on glass it soon begins to dry irregularly, when a smooth copy is out of the question. Equally illuminate it, and there will be little difficulty in making a good reproduction. If the photograph to be copied is mounted, make it as flat and smooth as possible, and use strong side light, and do not over expose. The granulations seem to be owing to particles *in* the paper, which reflect light irregularly, rather than roughness of surface, and which ought, with front lighting, to entirely vanish. We know from experience they do not, so the fault cannot be from this cause. The development needs no particular notice: any good kind will answer.

Daguerreotypes require considerable exercise of patience and most careful handling, as they possess qualities of their own that are calculated to give the copyist considerable trouble. They are on thin metal whose silvered surface reflects light like a mirror—is a mirror, in fact, and sometimes not a flat one—and the difficulty is to see the image without reflections and at right angles to it. Perhaps as good a plan as any is to take a small box—say a cigar box—remove one end, and at the opposite cut away about an inch of the lid, and line the box with black velvet. The daguerreotype is fixed flat against the remaining end of the box with drawing pins, and is illuminated entirely from the slit in the lid above. Place it directly opposite the camera, covering the lens mount and any bright surface with black cloth or velvet, and proceed to copy in the usual way. It will be noticed that the buff marks or scratches in polishing are more visible in one direction than another. The daguerreotype should be placed so that the light shines along and not across them; they look very unimportant on the metal, but in the copy they come out strongly, so special care must be taken to get rid of them as much as possible by judicious lighting; develop as for a copy of a glass positive.

On the border line between copying and photographing is the reproduction of brasses, medals, *bas-reliefs*, and casts. Anything in low relief should be copied in a strong side light, the subject being *placed upright*, the effect being entirely dependent on strong cast shadows. White marble and plaster casts require a developer well restrained, and great care taken not to over expose. Bronzes, the same kind of lighting, but a restrained developer. Brasses should be dulled by dabbing them over with putty to destroy reflections, and will offer no particular difficulty. In all copying the primary condition of success is the accurate adjustment of the camera, and the next the avoidance of reflections; these being carefully managed the rest of the process is comparatively easy.

EDWARD DUNMORE.

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CHOOSING SUBJECTS.

HERE we are—camera in hand—a magnificent morning, thirty miles from London—"far" enough "from the madding crowd"—what shall we do?

Well! we have the choice before us of this lovely valley with its purling brook, close-wooded scenery, and scattered cottages; or we have the adjacent hills, with wide expanse of open fields and a grand horizon. Is it to be simple landscape, or shall we see what we can find in the way of figure studies, or both? We have our single-view lens, and that other which we fancy is best for groups.

As yet not a zephyr disturbs the leaves, and only a few light, fleecy clouds, low down, are visible; we will give our attention to what is before us, for the clouds will gather by the middle of the day, and the wind will freshen, as it has done each day lately; we can then turn to the hills, where there are broad expanses of open country, with teams at plough, and women weeding or hoeing, and the wind will interfere with us less—if it be not something of an advantage to have a little of it in our figure groups with landscape.

Yes, this valley with its gabled cottages and gardens full of color is very charming, and seems to present to us a picture at every turn of the road.

But how deceptive is color to the photographer; how often we are allured by a landscape or a group, and how difficult it is to realize that the charm consists in its color, which a painter can render, but we cannot; divested of that, it is, as a picture, flat, stale and unprofitable. It wants a discerning eye to judge of what help color will be to us; the greys, and the greens, and browns and reds of the lichens on the brick or stone walls, the rich-colored mosses on the thatch, the yellow wash of the cottage front, are all renderable and effective in photography as giving gradations or contrast of light and shade where wanted. But those red brick cottages and gardens ablaze with color, that sparkle in their background of bright green trees, will be nowhere, or scarcely visible, in the photograph.

Let us get on, and keep our eyes open, not to what we see before us only, or what may actually present itself to us as a picture worth securing, for we may often go a long way and not satisfy ourselves in that respect, but to more simple and homely bits and turns and corners, that, with the introduction of a figure, may give us a picture full of interest. Here is a cottage—one of many in the village—very pretty, very nice, with the doorway partly overgrown with vine, and some worn red brick steps leading up to it, and a latticed window abutting on it. One would not think of taking that as it is; but what a capital setting for a group! Let us knock at the door and ask the occupier if we may take a "sketch" of her pretty doorway (if we were to call it "a photograph" she might mistake us for itinerant professionals, and expect to be asked some day for payment—such things have happened.) It may be she is a comfortable and obliging sort of woman, and would not mind our asking her to stand in the doorway with a broom in her hand, and one or two of those fair-haired children seated on the step, perhaps with their dolls or their school slates. Yes! she is pleased with the thought of it; she won't mind if you ask her to let you borrow a pail, or a jar, or a stool, and the bigger girl may come, the other is going to school.

Now then, treat the subject as you think best. The woman may be seated, and the girl standing, slate in hand, doing her sums; or standing, broom in hand or

knitting needles, while the girl prepares to move off with a basket on her arm. There are half a dozen ways of treating this doorway and these two figures open to your fancy; but let it be a simple, natural treatment of your subject, the accessories subservient to the group, and only such as you would be likely to find at the cottage doorway in the ordinary way.

Do what you can to make the people feel easy and at home with you; occupy them so that they may think of what you have set them to do, and not of the camera, and be careful not to try your sitters' patience too much. You know the capabilities of your lens, and should know how much will be comprised in your view. Get the focus and the margins of your picture, and then set your models within it where you have made up your mind they will look best and most natural.

It ought to be scarcely necessary to focus again, but a last brief look on the ground-glass may be taken, and the plate inserted into the camera.

Your figures in position, you may do all the little finishing touches to the hat, the hands, or the attitude, see that the accessories are right, and perhaps you may practice them in keeping still for two or three seconds, telling them you are not going to take them this time. If they behave as you wish they will have recovered their breath for the real exposure, for it is sometimes an awful ordeal to them (unless you have done your part nicely and kindly); it will not be so bad the next time. But give them due notice of the real exposure, and due notice when it is done, for they are grouped, not looking towards the camera, and will think it necessary to keep still until you liberate them.

Our sitters have behaved properly, the lighting was good, and everything favorable. One of those silver coins we have taken care to provide ourselves with will be an acceptable present to the little girl; or, just think, with such a negative as this will turn out, it will be well worth a shilling paid to the mother to buy a book, or another doll for the children. But do not promise a copy of the photograph unless you mean conscientiously to fulfil. The promise is treasured up, and the photograph looked forward to anxiously, and great will be the disappointment at its non-arrival, and disrepute of the amateur. Now, let us help, or offer to help, put back the things in their places, and move on, as an old timber wagon and rustic team of horses that passed by while we were busy has pulled up at the roadside, a little way up the village, and we must see if we can make use of it.

The group was well worth the second plate exposed upon it; it will give us the opportunity of experimenting, within limits, in the development, or correcting it; for how seldom do we complete a negative without the thought that it might have been improved by a little difference in its treatment under the developer; but having made up our minds which is the better and more satisfactory one for the best results in silver, the other should be put away, only to come out on an emergency, perhaps to make a transparency, if thin, or a platinotype print, if somewhat dense.

What a nice piece of old-fashioned English scenery! "There stands the broad-wheel'd wain," drawn up at the village inn, the swinging sign-board and water-trough at its base, the wagoner with a foaming mug of ale drinking the landlord's health. How well the three horses (two of them a russet-grey) stand out against the background of trees!

Is it to be figures with landscape, or landscape with figures? Decide quickly,

for we must interview the wagoner lest he be off, and having once started he cannot turn round to come back with that long length of timber.

A civil word makes it right all round; so we will go for a close-study subject. As they stand, the three horses, one behind the other, will never do; a foreshortened view will give an inordinate length to the appearance of the team, with the wide-angle lens which we must use to include the incidents of the hostelry and its surroundings. It is well; he will take off the two leaders and let them drink at the trough, while the wagoner—whip in hand—goes through the appearance of a drink with the landlord in front of the house. The rustic ostler boy is to have charge of the drinking horses, so we must instruct him as to what he is to do, and that he must not let the horses drink until we are quite ready. He is then to loll over the trough on the left-hand side, well in the foreground (he is a nice, smiling-looking lad, and stands easily and naturally), turned half away from us, and looking across the picture at the group opposite.

So, having got the margins of our picture—the house at the roadside on the right hand and the wagon drawn up in front of it, with the figures between, the sign-post and water-trough across the road on the left—it only remains for the two horses to take their places at the trough drinking, which they will do of themselves when allowed; the glimpse of the way out of the village and out of the picture will be suggestive; the sun is on our left, a little to the front, and will cast a shadow of the sign-post and the drinking horses well and definedly across the foreground of the picture. Everything else ready, the boy tumbles to our instructions very kindly, and leads the horses with a halter to the trough and they at once drink; we are sure they will remain still for ten or twenty seconds, and the boy lolls over the trough just right, as if he were to the manor born.

The exposure is made without loss of time, and all appeared to be right.

To avoid every sensation or suggestion of the presence of the photographer in our picture has been our first aim. We do not see that there will be any sign of it unless it be the grey horse left in the shafts; he was looking at the camera, probably owing to our being the last to speak or to move, but it will not matter. In this instance it is allowable, perhaps an advantage, in getting the spectators to exchange glances with the object which is the centre of attraction (the horse in the team), and then to look round at the surroundings that go to make the picture.

There would have been plenty of time to expose another plate, as the horses remained drinking long enough, and we had it ready, hoping that one of them might finish its draught first, and perhaps raise its head over the other's shoulder, and thus the almost exact overlapping of the two horses as they drank at the trough would have been avoided; but the right opportunity did not occur. We are well satisfied, however, that all was right, better than usually falls to the lot of the photographer in a studied, if impromptu, design, with improvised materials and untrained models.

The wagoner's luncheon-time has been badly broken in upon by us, so we will ask mine host to let him have a good meal, and this time a real draught of ale, while we apply ourselves to the lunch that the landlord's good wife has provided for us in the little bow-windowed parlor.

J. GALE.

(*Journal of London Camera Club.*)

CONCERNING THE PHOTO-CHROMATIC PROPERTIES OF SILVER CHLORIDE.

IN continuation of my experiments to obtain action of light through colored glasses upon silver plates treated with ferric chloride, I was induced to take up the microscopic study of the colored substance, and to obtain it isolated, expecting, according to the representation of Mr. Carey Lea, to be able to isolate the other colors.

Proceeding to operate according to the already-mentioned method—that is, by precipitating the ammoniacal solution of the color with solution of ferric sulphate, neutralizing with sulphuric acid, and (after repeated washing with distilled water) boiling first with nitric acid then with hydrochloric, I obtained, constantly with all the colors, identically the photo red described by Carey Lea.

As the same hue made its appearance upon the silver plate on applying heat to each color experimented upon, the identity of the result in the above experiments is shown by the action of the heat.

The separation of the color from the silver plates in crystalline form by the agency of ammonia water was not apparent on evaporation of the solvent medium. Likewise the amorphous mass obtained from the solution, hydrochloric acid, did not show any specific distinction in color; and consequently it is proved that this color only remains as long as the superficial film deposited upon the silver plate is not destroyed by the solvent medium.

I accordingly procured a very thin film-like pure silver plate, and flowed it upon a solution of ferric chloride for 10 to 12 seconds, so that a free surface of silver was obtained; and after allowing the peculiar colors red and violet to be produced upon this plate, I dissolved the latter in nitric acid.

The colors separated in form of thin laminæ, surrounded for the most part by straight lines, and indeed the red silver chloride, as well as the violet, with unaltered color.

These red and violet scales exhibited by transmitted and reflected light the same color, consequently it follows that the color is produced by the origination of waves of interference, and exactly in the same way as the interference in the plates is produced by incident and reflected light waves. The silver chloride not colored by the light has on separation from the silver plate by nitric acid, the structure of yellow laminæ. The solution of the color by nitric acid renders possible a pure form for analysis.—GEORGE STAATS, in *Berichte der Deutschen Chemischen Gesellschaft*.

THE PHOTOGRAPHIC SOCIETY OF PHILADELPHIA.

A STATED Meeting of the Society was held Wednesday evening, October 3d, 1888, with Vice-President John G. Bullock in the chair.

By direction of the President, Messrs. John G. Bullock, Samuel M. Fox and Robert S. Redfield, were appointed as members of the Joint Exhibition Council to represent the Society in connection with the next exhibition which will be held in Philadelphia in the spring of 1889.

The Secretary read the report of the Board of Judges for the Second Annual Joint

Exhibition recently held in Boston as submitted to the Committee of Arrangements of that Exhibition.

The Committee on Membership reported the election of the following active members: Frank S. Lewis, T. T. Eckert, Jr., Robert E. Pettit and Charles Schaffer, M. D.

The paper for the evening was read by Mr. John Bartlett, on the Successful Use of Flash-Light Compounds in Photography.

Mr. S. M. Fox thought a common mistake in flash-light photography was uncapping the lens too soon. This should be done only an instant before igniting the powder, otherwise the light of burning lamps, etc., was unduly impressed on the plate. He mentioned a case in which a lighted lamp which had been used as an aid in focusing, was carried across the room after the cap was removed, the result being a streak of light on the plate.

Mr. Stirling recommended the use of a double pneumatic exposing and igniting apparatus, one bulb and tube opening the lens an instant before the other ignited the powder.

Mr. W. H. Rau advocated the use of large charges of powder to give plenty of light, particularly with interiors or for dark drapery.

Mr. Supplee said the same rules should govern as with daylight exposures, bearing in mind that with a group requiring the camera to be at a greater distance than with a single figure if the distance was doubled, the exposure should be quadrupled, consequently four times the amount of powder would be required, other things being equal.

Dr. Charles A. Oliver stated that there was one point in Mr. Bartlett's paper to which he desired to take exception, and that was that the foreign observers had obtained successful results in Retinal Photography. Upon account of the convex surface of the anterior portion of the eye, there was in all of the results so far obtained, so great a reflex that the picture gave nothing more than a vague idea of the fundus of the eye, associated with a large cone-like light-streak. He had been working at the subject for more than two years, and had found the greatest trials in constructing a fixed apparatus. The corneal reflex he thought he had at last conquered by the adoption of suitable lenses. As soon as practicable he would, in connection with Dr. Wharton Sinkler, read a short paper before the Society upon the subject.

Mr. Walmsley exhibited and fully described Eastman's new "Kodak" Detective Camera, probably the smallest, most compact and effective camera of the kind yet introduced. The camera contains a roll holder with material for 100 circular pictures $2\frac{3}{8}$ diameter. The lens is of the rapid rectilinear type of short focus, requiring no adjustment. Either instantaneous or time exposure may be made.

Mr. Carbutt showed a negative made on an orthochromatic plate taken from a package prepared and packed just one year ago. The plate had every appearance of one freshly prepared, the time which it had been kept having had no deleterious effect upon it.

Adjourned.

ROBERT S. REDFIELD,

Secretary.

SECOND ANNUAL EXHIBITION OF PHOTOGRAPHS.

Boston, May, 1888.

REPORT OF THE JUDGES.

To the Committee of Arrangements:—

The undersigned, your Board of Judges, have the honor to submit their report.

Believing a high standard of excellence to be the aim of the societies that are holding these exhibitions, the judges have endeavored to give recognition to such work only as seemed to them to come up to that standard.

In some departments were seen examples of a high order of work, in which selection of material, composition, effects of light and shade, and skilful execution were happily combined. They had true artistic feeling, a feature that is wanting in most photographs. Such pictures reveal art possibilities in photography that must have been a surprise and delight to many, and will no doubt exert a strong influence for progress upon all who aim to produce the highest kind of work.

Your jury must express a measure of disappointment in not finding in the department of portraiture examples worthy of high commendation, since in a field so valuable and interesting much might be reasonably expected. In the opinion of the judges, he who desires to produce fine portraits would do well to avoid the hackneyed methods so common and wearisome, out of which little good is likely to come. He must have some notion of what goes to make a good portrait, and that means cultivation in art. A careful study of photographs from the works of the best portrait painters would be an excellent preparation. Observe how they composed, enlightened and modeled their figures—in brief, what was their conception of a portrait.

The artistic possibilities of every subject should be well considered. Technical excellence should not be valued for more than its worth. Many amateurs and most professionals think too much of it. The satisfaction one feels in looking through a good negative should not be ignored, but far greater is the pleasure one derives in contemplating a well-selected subject, composed and otherwise treated with taste and feeling.

It is the art side of photography, then, to which we respectfully urge amateurs to give their best attention. In this direction lies the way to true progress.

We have considered it within our province to discuss only some of the principles which we believe should govern the amateur, leaving to the various societies the settling of questions of technique and processes.

Subjoined is a list of exhibitors to whom diplomas are awarded.

[Signed,] J. EASTMAN CHASE,
J. FOXCROFT COLE,
JOSEPH R. DE CAMP.
JOHN DUNMORE,
FRANK RUSSELL.

LIST OF AWARDS.

FOR LANDSCAPES: Frank M. Sutcliffe, Whitby, England, Nos. 1, 2, 3; Henry A. Rowland, Baltimore, Md., Society Amateur Photographers, New York, No. 157; John Patterson Gibson, Hexham, England, No. 289.

FOR MARINE VIEW,—SURF: H. A. Latimer, Boston, Mass., Boston Camera Club, No. 235.

FOR FIGURE COMPOSITION: George B. Wood, Philadelphia, Penna., Photographic Society, Philadelphia, No. 49.

FOR ANIMALS: Frank M. Sutcliffe, Whitby, England, No. 3; George B. Wood, Philadelphia, No. 4.

FOR INTERIOR: Miss A. L. Richards, Boston, No. 93.

FOR INSTANTANEOUS WORK: Daniel Pepper, Philadelphia, Photographic Society of Philadelphia, No. 231.

FOR VIEWS TAKEN IN A FOREIGN CITY: John C. Lee, Roxbury, Mass., Boston Camera Club, No. 173.

FOR PICTURE BY A NEW PROCESS: Henry Harrison Supplee, Philadelphia Photographic Society, Philadelphia, No. 104, flash-light.

FOR MICRO-PHOTOGRAPHS: R. R. Andrews, Cambridge, Mass., Boston Camera Club, No. 1.

FOR BEST WORK BY A LADY: Miss Catharine Weed Barnes, Albany, N. Y., Society Amateur Photographers, N. Y., Nos. 126-152, inclusive.

FOR TRANSPARENCIES: Henry A. Rowland, Baltimore, Md., Nos. 7 and 8.

FOR LANTERN SLIDES, Set of Six: H. A. Latimer, Boston, No. 14.

A set of six lantern slides exhibited by Charles Simpson, of the Society of Amateur Photographers of New York, not catalogued, deserves honorable mention for skillful handling.

Following is a list of Lantern Slides selected from various sets by the judges as worthy of commendation:

Hawthorne Street, Roxbury,	Arthur L. Plimpton, Boston,
A June Sunset,	Miss A. L. Richards, Boston,
Drifting, Eastport, Maine,	Robert L. P. Mason, Prov., R. I.,
The Great Slide Ravine, Waterville, N. H.,	Wm. S. Briggs, Boston,
Mt. Osceola and Mad River,	Wm. S. Briggs, Boston,
Mad River Notch,	Wm. S. Briggs, Boston,
Surf at Asbury Park,	E. F. C. Davis, Pottsville, Pa.,
The Midnight Sun, Alaska,	Geo. Marshall Allen, N. Y.

The above report has just been received from the judges.

PHOTOGRAPHIC SECTION OF THE ROCHESTER ACADEMY OF SCIENCE.—Regular meeting held September 25th. President Croughton in the chair. Mr. G. W. Rafter delivered a lecture on photo-micrography showing the working of his enlarging camera, with attachments of his own invention, among which was a condensing lens attachment for making instantaneous exposures, with which he photographs living microscopic animals. Mr. Rafter is an expert in this department of photographic work, and his lecture showed the practical as well as the theoretical part of the subject. The subject for the next meeting will be Lantern Slide Making, by Mr. C. F. Hovey.

JAMES STREETER, *Secretary*.

ELECTRO CHEMICAL ACTINOMETER.

(By Gouy and H. Rigollett, *Compt. Rend.* 106-1470-1471.)

It is known that if copper with a superficial layer of oxide or basic salt is placed in a solution of copper sulphate, its electro-motive force varies under the influence of light, but the phenomena are only distinct when the intensity of the light is high. The authors find that if copper with the layer of the oxide is immersed in a solution of the metallic chloride, bromide or oxide, it is very sensitive even to rays of low intensity, and may consequently be used as an actinometer.

A carefully-cleaned plate of copper is heated over a Bunsen-burner until the iridescence is replaced by a uniform tint. The superficial layer then consists mainly of cuprous oxide; if the heating is continued, cupric oxide is formed, and the plate is less sensitive. It may be protected by a layer of melted paraffine whilst cooling.

When a plate thus prepared is placed in a solution of sodium chloride together with a clean plate of copper, the electro-motive force of the element is a few hundredths of a volt, the oxidized plate being positive. When exposed to light, the electro-motive force increases, the oxidized plate being more strongly positive.

Instead of plates of different kinds, the two oxidized plates may be used, only one being exposed to light. The effect is instantaneous when the light is cut off.

Diffuse daylight produces an alteration of several hundredths of a volt, and direct sunlight an alteration of at least a tenth of a volt.

Gas and lamp flames have also a marked effect, and it would seem that the couple is sensitive to all the visible rays.

The variation in the electro-motive force is greater when the circuit includes a resistance of several hundred ohms.

With a Thomson galvanometer it is possible to recognize the effect of a candle flame at a distance of several metres.

Solutions of bromide behave in much the same way as chlorides, but in solutions of iodides the couple is less sensitive.—C. H. B., in *Journal of the Chemical Society*.

ELECTRO-MOTIVE FORCE PRODUCED BY THE ACTION OF LIGHT ON SELENIUM.

THE fact that an electro-motive force can be produced by the action of light on selenium was discovered by Adams and Day (*Proc. Roy. Soc.* 25, 113), who found that when one end of a plate of selenium, into opposite ends of which platinum wires had been melted, was submitted to the action of light, a current was produced, in general from the dark to the light electrode, but not infrequently in the opposite directions.

The subject was next investigated by Kalischer, who used an intermittent beam of light, and succeeded in obtaining sounds in a telephone in circuit with the selenium. Fritts used a sheet of gold as one of the electrodes, and illuminated the selenium through the transparent leaf. He succeeded in a good many cases in obtaining a measurable difference of potential between the ends of the selenium plate, and found that the current arose immediately on exposing one of the electrodes to the action of light, and ceased instantly when the illumination ceased, but as long as the illumination was maintained constant, the current remained constant.

He came to the conclusion that the current was due to the direct transformation of luminous into electric energy.

He also concluded from his experiments that there was no relation between the sensitiveness of different specimens to the effect of light in altering the resistance and producing and electro-motive force respectively. W. Von Uljanin (in *Ann. Phys. Chem.*, 2, 34, 241) gives the results of his further investigations from which he deduces the following theory to account for the action of the electro-motive force.

He supposes that the selenium exists in the plates in several allotropic forms, some only of which are sensitive to the action of light. He further supposes that the plates contain particles capable of electrolysis consisting either of combinations of different allotropic forms of selenium or of selenides of the metals present as impurities. He then assumes that the effect of exposure to light is in the first place to transform the sensitive particles into others which are electro-positive to them, and in the second place, to facilitate the reunion of the electrolytic particles which have been broken up by the passage of the current.—G. W. T., in *Journ. of the Chem. Soc.*

BOOKS RECEIVED.

LETTERS ON LANDSCAPE PHOTOGRAPHY, by H. P. Robinson, London, England. Published by the Scovill Manufacturing Company, N. Y.

So much has been written on the application of the principles of art to photography, and by such injudicious instructors, that we fear our delightful profession has received more injury in the house of its friends, than from the ranks of its detractors. These high art talks may serve their purpose in elevating photography by the stimulus they give. He who aims at the moon, though he will never hit it, shoots higher than he who aims at a bush. There are certain limitations in our photographic art, which make it even more difficult to achieve greatness in it than in the profession of the painter; but he who recognizes these limits, and still produces artistic work which in motive often surpasses the ideas of the painter, is worthy of the highest honors, and should be looked to for guide and counsel. Mr. H. P. Robinson has shown that limitations cannot keep back the expression of beautiful conceptions. He has shown that the camera, though more unwieldy than the brush, can body forth the ripe perfections of taste, feeling and fancy, and what is especially valuable to us is his possession of the faculty to trace for our instruction the genesis of his ideas. The series of letters is another charming addition to the list of delightful works from his pen; the principles of art are not set forth in formidable formulæ, but skilfully interwoven with pleasing conversations.

"THE PHOTOGRAPHIC NEGATIVE," by W. H. Burbank.—We are glad to see a continuation of Mr. Burbank's labors in photographic literature. "Photographic Printing Methods" gave evidence of the ability as well as the good judgment of the author in treating a subject which has been the theme of so many writers in photography. His manner of disposing of the matter showed at once his intimate acquaintance with all the various processes, and inspired the beginner with confidence in the

plan of instruction given. The second book, the "Photographic Negative," is a necessary adjunct to the first publication. The same plan of treatment is adopted; the same clear and concise method pursued, and the same evidence of familiarity with the subject matter is manifest at once on reading the book. The author lays aside with becoming modesty all claim to originality, but we would remind him that his book bears witness to the fact that originality in an author, if precluded by the nature of the subject, is bound to show itself in some form or other; in the present instance, it is manifest in the ability displayed in selection and arrangement, and in the subordination of minor detail. The "Photographic Negative" is published by the Scovill Manufacturing Company, New York.

Sun and Shade is a monthly periodical, whose object is to make the general public acquainted with the recent advances made in the reproduction processes. The first number was exceedingly popular by reason of the fine work it presented; the second issue is quite equal to the initial number. "Evening," a reproduction in photogravure of Robert Minor's painting, is a fine study in chiaro-oscuro, showing well the effect produced by massing lights and shades. "Storm," and "The French Squadron," are also well rendered, and the reproduction of the etchings by Otto Bucher are very pleasing and delicate. The publication deserves a liberal support from every one interested in art and photography. It is published by the Photogravure Company, of 853 Broadway, N. Y.

THE EASTMAN CO., of Rochester, N. Y., sends us a pamphlet containing a description of the city of Rochester and its suburbs, published by C. S. Serrill & Co., of Buffalo. The most pleasing feature is the numerous illustrations in the shape of graceful little etchings, made from photographs taken with the marvelous Kodak Camera.

WE have a number of *genre* photographs by Frank Ott, of Towanda, Pa., made by the Blitz-pulver light with Ross lens. The subjects are treated in a pleasing manner, and the quality of the photographic work is amongst the best we have seen made with the flash-light. We understand that Mr. Ott does a lively business in photographing families at their own homes. If all his work is as excellent as the specimen sent us, he deserves a good patronage.

MR. JULIUS SACHSE, of this city, is using the camera in studying the growth of the night-blooming *Cereus*.

He has taken advantage of the facility for obtaining impressions by means of the magnesium light, and has succeeded in securing a series of remarkable photographs, taken at a short interval of five to fifteen seconds. We hope to give this series in our next number, together with the results of Mr. Sachse's investigations, which will no doubt form an interesting paper to students in Biology.*

OCTOBER BARGAIN LIST.

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Desiring to reduce our stock, we will sell for a short time.

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1—8x10 Hough's Exterior ground, good as new, light left of sitter	9 00
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1—Bicycle Camera, lens, holder and case, good as new	7 00
1—8x10 American Optical Co.'s Royal Camera, double swing and carriage movement, . .	25 00
1—8x10 Ferrottype Box, Carriage movement and glass cornered holder and 4x4 lens	30 00
1—5x7 Flammang revolving back camera, three holders, extension tripod, Darlot wide angle lens and canvas case	50 00
1—5x8 Tourist Outfit, including 5x8 Tourist Camera Box, 2 Daisy Plate Holders, 1 Extension Tripod, and 1 Canvas Carrying Case, very little used. Price, new, \$40.50, will sell for	30 00
1—10x12 Cone View Camera, Double Swing, new	52 80
1—4x4 Standard Portrait Camera wet holder, new	14 75
1—4x5 Flammang revolving back Camera, new,	25 00
1—4 1/4 x 5 1/2 No. 202 A. Scovill Outfit	20 50
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1—Focusing Glass	75	1—8x10 Voigtlander Portrait Lens	80 50
1—11x14 Pantagraph Lens, new	38 00	1—4x4 Dallmeyer Group Lens	50 00
1—4x5 Dallmeyer (\$56) Portrait Lens, nearly new	20 00	1—4x4 Walzl Portrait Lens	20 00
1—Set $\frac{1}{2}$ size Tubes	18 00	1— $\frac{1}{8}$ Beck Microscopic Objective, nearly new,	20 00
1—No. 3 Euroscope Lens	50 00	1— $\frac{1}{4}$ size portrait lens	3 00
1— $\frac{1}{2}$ size Harrison Portrait lens, cut for stops	10 00	1—4-4 M. Hill & Co. Portrait Lens	20 00
1—4x4 Harrison Portrait Lens, cut for stops	20 00	1—4-4 Morrison Peerless Portrait Lens and Lightning Shutter	35 00
1— $\frac{1}{2}$ size Voigtlander Lens	15 00	1—Matched Pair Morrison wide-angle view Lenses fitted with Hoover Shutter	45 00
1—Matched pair German Stereoscopic Lenses, in good order	15 00	1—4 D Dallmeyer 8x10 Portrait Lens	75 00
1—4x5 Dallmeyer View Lens	12 00	1— $\frac{1}{4}$ size Harrison Portrait Lens	5 00
1—4x4 Darlot Globe Lens	25 00	1— $\frac{1}{4}$ size E. A. Portrait Lens	5 00
1— $\frac{1}{4}$ size L. W. Krantz Portrait Lens	12 50		

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